



Request for N-STEPS Support

I. Contact Information

EPA Regional Contact Information

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State Contact Information

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*If a cross-regional effort, please provide other regional contact information:

II. Project Information

Proposed Project Type (check all that apply)

Preliminary N-STEPS staff review and feedback on:

- ☐ Draft analysis
- ☐ Draft criteria document review
- ☐ Literature review
- ☐ Independent scientific peer review (please indicate the preferred number of reviewers)
- ☒ Data analysis and presentation
- ☐ Workshop/Training

Proposed Project Description Project timeframe: July 1, 2013 through June 30, 2014

Estimated level of effort and cost: \$120,000.00

Applicable State(s): New Mexico

Waterbody type(s): All Wadeable perennial streams/rivers

Parameter(s): Total Nitrogen and Total Phosphorous

Does State have a mutually-agreed upon nutrient criteria plan?

Y ☒ N ☐

Has the State submitted milestone dates for the associated WQ PAM?

Y ☒ N ☐

Is the project associated with milestones in the State's mutually-agreed upon nutrient criteria plan?

Y ☒ N ☐

If yes, please provide a description of the associated milestone with a reference to the plan language.

From Table 1 of New Mexico's Nutrient Reduction Strategy for Protecting and Improving Water Quality (2012) the following milestone is listed with a 2014 target date:

Change-point analysis to link TN and TP concentrations to a biological response (benthic macroinvertebrates).

- Evaluate and revise numeric nutrient thresholds (TN and TP) based on new information.
- Refine nutrient AP for wadeable, perennial streams.

If no, please describe how the project supports the State's efforts to adopt numeric nutrient criteria.



Project Summary:

The United States Environmental Protection Agency (USEPA) nutrient criteria guidance recommends that criteria be derived for both total nitrogen (TN) and total phosphorus (TP) (primary causal variables) and chlorophyll a and clarity (primary response variables) that are protective of designated uses. The guidance does not preclude the use of alternative causal or response variables, and suggest several additional variables such as dissolved oxygen, trophic state indices, and biocriteria (USEPA 2000). EPA recommends three methods to establish nutrient criteria (USEPA 2000): a frequency distribution reference-based approach, a stressor-response approach, and literature-derived values. ***We are proposing the use of the stressor-response relationships in developing thresholds using datasets collected by the State of New Mexico and the National Aquatic Resource Surveys. This analysis will use concurrently measured cause and response variables including nutrients and other related water quality parameters, as well as biological data, i.e., algal and benthic macroinvertebrate community composition and chlorophyll a concentration.***

While a few streams have segment specific numeric criteria for total phosphorus, the State of New Mexico currently has no general numeric criteria for nutrients. The narrative criterion in the State of New Mexico Standards for Interstate and Intrastate Surface Waters found at § 20.6.4.13 NMAC provides that (NMWQCC 2011) “Plant nutrients from other than natural causes shall not be present in concentrations which will produce undesirable aquatic life or result in a dominance of nuisance species in surface waters of the state.” Towards the implementation of this narrative criterion, ***New Mexico has adopted an assessment method applicable to wadeable perennial streams that evaluates nutrient impairment for the purpose of Clean Water Act § 303(d) listing and TMDL development.*** The wadeable stream assessment utilizes a weight-of-evidence approach that includes algae coverage, periphyton coverage, anaerobic conditions, dissolved oxygen, pH, total nitrogen (TN), total phosphorus (TP), and quantitative measures of both stressor and response variables (USEPA 2010) using either a threshold or, in unique cases, reference-based approach (USEPA 2000). The State’s use of the nutrient assessment protocol has resulted to date in 61 EPA-approved nutrient TMDLs, i.e., TN and/or TP. Unfortunately, the NMED assessment for nutrients, while successfully implemented, is based on thresholds that were derived from a frequency distribution curve and are not directly linked to undesirable responses or use impairment. Also the reference-based approach is resource intensive and requires identification of a specific reference site for comparison versus identification of a reference condition (Stoddard et al. 2006), which reduces the potential for bias.

A stepwise criteria development approach is being proposed as described in Empirical Approaches for Nutrient Criteria Derivation (USEPA 2009) for the nutrient development protocol framework, except the goal at this time is to propose numeric translators for New Mexico’s narrative nutrient water quality standard rather than actual water quality criteria until the numeric translators have been successfully tested through bioconfirmation. The Empirical Approach for Nutrient Criteria framework includes five steps, (1) Selecting and Evaluating Data; (2) Assessing the Strength of the Cause-Effect Relationship; (3) Analyzing Data; (4) Evaluating Estimated Stressor-Response relationship; and (5) Evaluating Candidate Stressor-Response Criteria. Toward this end New Mexico, working with Tetra Tech, completed a preliminary analysis that undertook Step 1 and started the analysis for Steps 2 and 3. ***Here we will continue to pursue this Nutrient Criteria Framework by undertaking the following scope of work:***

TASK 1 – COMPILE AND QA DATA

The contractor shall complete (as begun during the proof-of-concept) the existing data compilation for Wadeable Perennial Streams (e.g., National Wadeable Stream and National Rivers and Streams Assessment, EMAP Western Pilot) for New Mexico and neighboring states, as directed by the WAM, into a single dataset. The contractor shall review other available stream sampling data provided by the State of New Mexico to determine whether and how that data may be used in the analysis. GIS-based catchment data provided by the EPA Region 6 office (e.g., watershed area associated with each sampling location, elevation, mean annual precipitation, land use, etc.) will be merged with stream data into a comprehensive dataset. Exploratory data analysis techniques (e.g., correlation analysis, scatter plots, histograms, etc.) will be used to identify potential outliers or other data quality issues. Available supplemental data such as field data forms and inspection of site setting using Google Earth® may be used to validate, correct, or reject data flagged as questionable during quality assurance (QA) review.

Note: A quality assurance project plan (QAPP) for the secondary data collection was developed and approved as part of the Tetra Tech proof-of-concept paper. Prior to the initiation of Task 1, the QAPP will be reviewed and approved.

TASK 1 – DELIVERABLES

1. The contractor shall complete the compilation and exploratory data analyses of existing Wadeable Perennial Streams data for New Mexico and neighboring states, as needed, into a single analysis dataset.
2. The compiled data and data analyses shall be delivered to the WAM in a Microsoft Excel and/or Access format as directed by the WAM.

TASK 2 – DEVELOP STREAM CLASSIFICATION AND FINALIZE SITE CONDITION CLASS ASSIGNMENTS

Natural gradients in the dataset that affect potential nutrient and biological response indicators will be examined using appropriate statistical methods (e.g., regression, cluster analysis, discriminate function analysis, principle component analysis, etc.) to develop a stream classification scheme that best captures the environmental variability for subsequent statistical analyses. Aggregate ecoregions used in the EMAP-West study (Stoddard et al., 2005)—Mountains, Plains, and Xeric—may be considered as a starting point for stream classification, but may be modified if necessary. Once stream classification has been completed, the contractor shall coordinate with the WAM to classify sites according to anthropogenic influences (human disturbance gradient) and finalize a list of reference sites (i.e., minimally disturbed or best available sites) for each stream class.

TASK 2 – DELIVERABLES

1. The contractor shall deliver to the WAM a Draft Stream Classification Scheme with potential total nitrogen and total phosphorus and response variable thresholds for each stream class.
2. After receiving comments on the Draft Stream Classification Scheme with potential TN and TP and response variable thresholds, the contractor shall prepare a Final Stream Classification Scheme and list of reference sites (i.e., minimally disturbed or best available sites) for each stream class.

TASK 3 – SELECT NUTRIENT AND BIOLOGICAL RESPONSE INDICATORS AND DETERMINE RANGE OF VALUES FOR REFERENCE SITES

Conduct analysis of stressor-response relationships, e.g., focusing on measures of dissolved oxygen such as P_{\max} (the maximum rate of production) and R_{\max} (the maximum rate of respiration), periphyton chlorophyll *a*, sestonic chlorophyll *a*, and benthic macroinvertebrates, which are typically the identified response variables in nutrient-enriched waters. Appropriate biological response indicators that have clear and quantifiable relationships to the selected nutrient indicators shall be selected or constructed from existing metric values and/or data.

TASK 3 – DELIVERABLES

1. The contractor shall deliver to the TOM within 60 calendar days of the completion of Task 2, Draft Nutrient and Biological Response Indicators.
2. Within 30 calendar days of receiving comments on the Draft Nutrient and Biological Response Indicators, the contractor shall prepare a Final Nutrient and Biological Response Indicators.

TASK 4 – ANALYZE AND CHARACTERIZE NUTRIENT RESPONSE ASSOCIATIONS

The contractor shall evaluate associations between nutrient metrics and biological condition indices and derive potential nutrient indicator threshold values. For example, the contractor may consider distribution percentiles of the nutrient indicators selected in Task 2 to determine candidate threshold values. For stream classes where data are sufficient (i.e., a sufficient number of sites have useable biological condition data), the contractor may consider developing candidate stressor-response indicators for dissolved oxygen (e.g., P_{\max} and R_{\max}), chlorophyll *a*, total nitrogen, total phosphorus, and appropriate benthic macroinvertebrate metrics to update New Mexico's current nutrient narrative implementation approach. The contractor may also explore translating the weight of evidence approach in the wadeable streams assessment into a trophic index score (i.e., combining the results from the cause and response variables into one score rated 0 – 100 that can be used to evaluate use attainment in the stream).

TASK 4 – DELIVERABLES

1. The contractor shall deliver to the TOM within 60 calendar days of the completion of Task 3, Draft Nutrient Numeric Translators Specific to Each Stream Class.
2. Within 30 calendar days of receiving comments on the Draft Nutrient Numeric Translators Specific to Each Stream Class, the contractor shall prepare a Final Nutrient Numeric Translators Specific to Each Stream Class.

TASK 5 – PREPARE TECHNICAL REPORT

The contractor shall prepare a technical report. The report shall include a brief description of the project background, a detailed description of the data and analytical methods used, a discussion of the rationale for the analytical approach, graphical and tabular presentation of analytical results, a discussion of the significance and limitations of the results, and recommendations regarding nutrient translators selection, critical data needs, and potential future refinements.

TASK 5 – DELIVERABLES

1. The contractor shall deliver to the TOM within 60 calendar days of the completion of Task 4, Draft Written Report submitted in Microsoft Word and/or Excel as appropriate.

2. Within 30 calendar days of receiving comments on the Draft Written Report, the contractor shall prepare a Final Written Report submitted in Microsoft Word and/or Excel as appropriate.

First time request?

Y ☒ N ☐

If not, please provide details of previous request(s):

Date of request(s): 31 January 2013

Associated with previous N-STEPS support?

Y ☐ N ☒

If yes, please provide details of associated work:

Date of request(s): Not Applicable. No prior requests.

N-STEPS project period of performance (approximate): Not Applicable

Brief description of associated work: Not Applicable

Applicable State(s):

III. Cost-share Information (if applicable)

Is the Region(s) providing funding support?

Y ☐ N ☒

If yes, what degree of support? Region 6 will be providing no funding.

Please provide procurement information to N-STEPS Program Manager after EHPB approval.